

REMARKS

Claims 1-7 are pending.

Claims 1-7 are rejected under 35 U.S.C. §103(a) as being unpatentable over U. S. Patent No. 5,365,009 (Uppal) in view of U. S. Patent No. 6,040,259 (Mohr) on the ground that it would have been obvious to use the zeolite L catalyst disclosed in Mohr in the process disclosed in Uppal and thereby arrive at Applicant's invention. This rejection should be withdrawn because it would not have been obvious for a person of ordinary skill in the art to combine the teachings of Uppal with those of Mohr and thereby arrive at a process for regenerating catalyst comprising zeolite L that comprises contacting the catalyst with ozone at regeneration conditions and in the absence of a halogen-containing compound that can be oxidized by ozone at the regeneration conditions.

Uppal discloses a process to regenerate a solid alkylation catalyst. See col. 1, lines 6-12 and col. 2, lines 32-57. The alkylation reaction of paraffins and olefins deposits carbonaceous material on the catalyst. Uppal's regeneration process uses two steps to remove the carbonaceous material. First, the catalyst is heated in ozone to form ozonated hydrocarbons containing carbonyl carbons. See col. 4, lines 7-43. Second, the catalyst is swept with a desorption fluid to remove the ozonated hydrocarbons until a photoacoustic infrared spectrum of the catalyst shows essentially no carbonyl peak within a specified range of wave numbers. See col. 4, line 44 to col. 5, line 2.

The desorption step is a critical step in Uppal's regeneration process. See claim 1, lines 45-51, and claim 7, lines 27-33. Uppal's examples show that regenerating spent zeolite Y with ozone but without a desorption step does not restore the alkylation activity and selectivity to those of fresh zeolite Y. Example 2 compares fresh zeolite Y (Run A) and spent zeolite Y that has been ozone-regenerated and desorbed (Run B). Runs A and B showed close alkylation activity and selectivity. See col. 5, line 56 to col. 6, line 34, and especially col. 6, lines 11-15 and 30-34. Example 3, on the other hand, compares fresh zeolite Y (Run C) and spent zeolite Y that has been only ozone-regenerated (Run D). Run D showed lower alkylation activity and selectivity than not only Run C, but also Runs A and B. See col. 6, line 36 to col. 7, line 9, and especially col. 6, lines 51-55 and col. 7, lines 5-9. Finally, Example 4 compares the photoacoustic infrared spectra of fresh zeolite Y, spent zeolite Y that has been ozone-regenerated

and desorbed, and spent zeolite Y that has been only ozone-regenerated. The spectrum of spent zeolite Y that has been ozone-regenerated and desorbed is closer to the spectrum of fresh zeolite Y than is the spectrum of zeolite Y that has been only ozone-regenerated. See col. 7, lines 11-29 and Figure 4.

All of Uppal's examples use only LZY-82, an ultrastable Y zeolite. See col. 5, lines 22-26, and 42; col. 6, lines 19, 38, and 59; col. 7, line 13. In addition to LZY-82, Uppal teaches that the alkylation catalyst may be a zeolite, such as an alumina silicate, a silicoaluminophosphate, and in particular the zeolite can be a larger pore molecular sieve such as zeolite Y. See col. 3, lines 58 to col. 4, line 6. Significantly, however, Uppal does not teach adding a metal such as Mohr teaches to the alkylation catalyst. See entire Uppal patent.

Mohr, on the other hand, discloses a method of preparing a metal-containing, two-zeolite catalyst. See col. 1, lines 1-12; col. 3, lines 36-42. The metal catalyzes hydrogenation and dehydrogenation reactions. See col. 7, lines 32-53. Mohr's objective is to disperse the metal uniformly so that the catalyst has high hydrogenation/dehydrogenation activity and reduced cracking activity. See col. 1, lines 9-12; col. 2, lines 60-64; col. 3, lines 19-24 and 42-44; col. 4, lines 5-11; and col. 8, lines 23-27.

Mohr disperses the metal by adding it at a critical step during catalyst preparation. Catalyst preparation comprises three basic steps. The first basic step is preparing a first zeolite. See col. 8, lines 28-45. The second basic step is binding the metal and the first zeolite with silica. See col. 8, line 46 to col. 9, line 12. The third basic step is converting the silica to a second zeolite. See col. 9, lines 13-65. Mohr further divides these three basic steps into six sub-steps, as summarized at col. 7, line 63 to col. 8, line 6. To improve the metal dispersion or attain the advantages of the invention, the metal must be added after the first basic step, but prior to sub-step #6. See claim 1, lines 25-34; claim 20, lines 37-46; col. 7, line 54 to col. 8, line 27, and especially col. 8, line 7-8.

Mohr teaches that many zeolites are suitable for his catalyst. Mohr teaches that the "(f)irst and second zeolites suitable for use in the zeolite bound zeolite catalyst of the present invention include large pore size zeolites, intermediate pore size zeolites, and small pore size zeolites. These zeolites are described in 'Atlas of Zeolite Structure Types'... which is hereby incorporated by reference." See col. 4, lines 51-57. Mohr then proceeds to teach examples of

each pore size: 9 structure type examples (including LTL) and 13 specific examples (including zeolite L) of large pore size zeolites, 9 structure type examples and 11 specific examples of intermediate pore size zeolites, and 5 structure type examples and 16 specific examples of small pore size zeolites. See col. 4, line 57 to col. 7, line 31, and especially col. 4, line 51 to col. 5, line 11.

Mohr teaches that his catalyst may be used in a significant number of hydrocarbon conversion processes at col. 10, line 26 to col. 12, line 67, but Mohr does not teach alkylation of paraffins and olefins. See entire Mohr patent.

The rejection of claim 1 under 35 U.S.C. §103(a) as being unpatentable over Uppal in view of Mohr should be withdrawn for the reason that it would not be obvious to a person of ordinary skill in the art who was seeking to regenerate a catalyst comprising zeolite L at the time the invention in claim 1 was made to modify the process in Uppal by using a zeolite L catalyst in Mohr and thereby to arrive at Applicant's invention. Uppal provides no motivation for a person of ordinary skill in the art to combine Uppal's teachings with those of Mohr for the following reasons. First, a person of ordinary skill in the art after having read Uppal would appreciate that Uppal's focus is on regenerating a catalyst for alkylating paraffins and olefins, and would not use Mohr's catalyst in Uppal's process since Mohr does not teach or suggest that his catalyst is suitable for alkylating paraffins and olefins. Even where Mohr teaches zeolite L, it is taught only for reforming and aromatization and/or dehydrogenation. See col. 6, lines 13, 22-23; col. 13, line 61 to col. 14, line 5; and Examples 3 and 4. Second, after having read nothing in Uppal about using a catalyst containing a hydrogenation/dehydrogenation metal, a person of ordinary skill in the art would not choose to use in Uppal's process a catalyst like Mohr's that requires a hydrogenation/dehydrogenation metal. Third, since Uppal's catalyst does not even contain a hydrogenation/dehydrogenation metal, a person of ordinary skill in the art after having read Uppal would not be motivated to inquire into, much less to combine, teachings on how to prepare a catalyst with a hydrogenation/dehydrogenation metal, which is one of Mohr's key objectives. Fourth, a person of ordinary skill in the art, after having read Uppal's teachings on catalyst regeneration would not be motivated to refer to Mohr for teachings on catalyst regeneration, since Mohr is silent on catalyst regeneration. Mohr deals with catalyst preparation. Fifth, a person of ordinary skill in the art who has read Uppal would find no motivation in Mohr's all-encompassing statement about suitable zeolites to choose any particular one of

Mohr's suitable zeolites, especially since chemical catalysis is an inherently unpredictable art and since Mohr's teachings are not limited to the large number of specific examples Mohr mentions. At most, Uppal in combination with Mohr may render it obvious to try another zeolite in the process of Uppal, but "obvious to try" is not the proper standard under 35 U.S.C. 103. Applicant was the first to teach a process for regenerating catalyst comprising zeolite I that comprises contacting the catalyst with ozone at regeneration conditions and in the absence of a halogen-containing compound that can be oxidized by ozone at the regeneration conditions. It is impermissible hindsight to use Applicant's disclosure to read the use of a zeolite taught by Mohr into Uppal's teachings.

For all of these reasons, Uppal and Mohr in combination do not render claim 1 obvious. Therefore, the rejection of claim 1 under 35 U.S.C. §103(a) as being unpatentable over Uppal in view of Mohr should be withdrawn. The rejection of claims 2-7 under 35 U.S.C. §103(a) as being unpatentable over Uppal in view of Mohr should be withdrawn for the reasons given in support of claim 1 because they are dependent on claim 1.

In view of the foregoing remarks, the subject application is now believed to be in a condition for an allowance of all claims and such action is respectfully requested.

This is intended to be a complete response to the Office action. If any matter remains which can be easily addressed, the Examiner is invited to call to resolve the issues.

Respectfully submitted,

UOP LLC



Michael A. Moore  
Attorney for Applicant  
Reg. No. 41,203